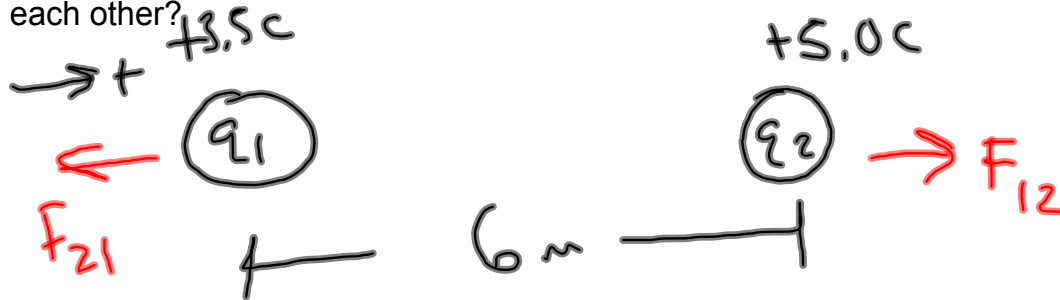
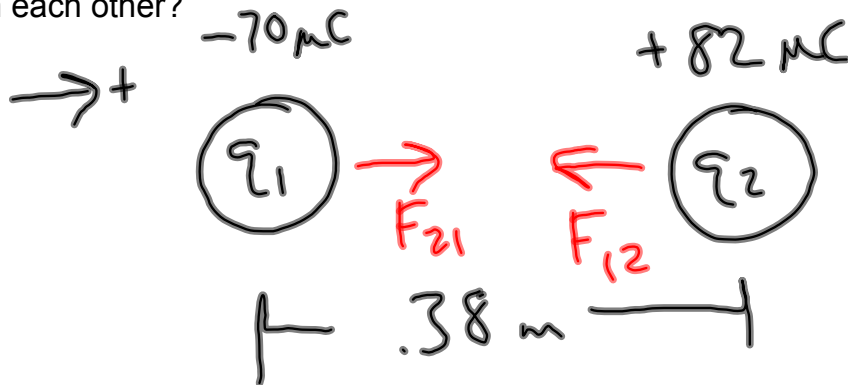


Two charges are stationary in space, and the first has a value of 3.5 C and the second has a value of 5.0 C. If the distance separating them is 6 m, what is the force they exert on each other?



$$\begin{aligned}
 F_{12} &= \frac{k |q_1| |q_2|}{r^2} \\
 &= \frac{(8.99 \times 10^9 \text{ N} \cdot \text{m}^2/\text{C}^2)(3.5 \text{ C})(5.0 \text{ C})}{(6 \text{ m})^2} \\
 &= 4.37 \times 10^9 \text{ N}
 \end{aligned}$$

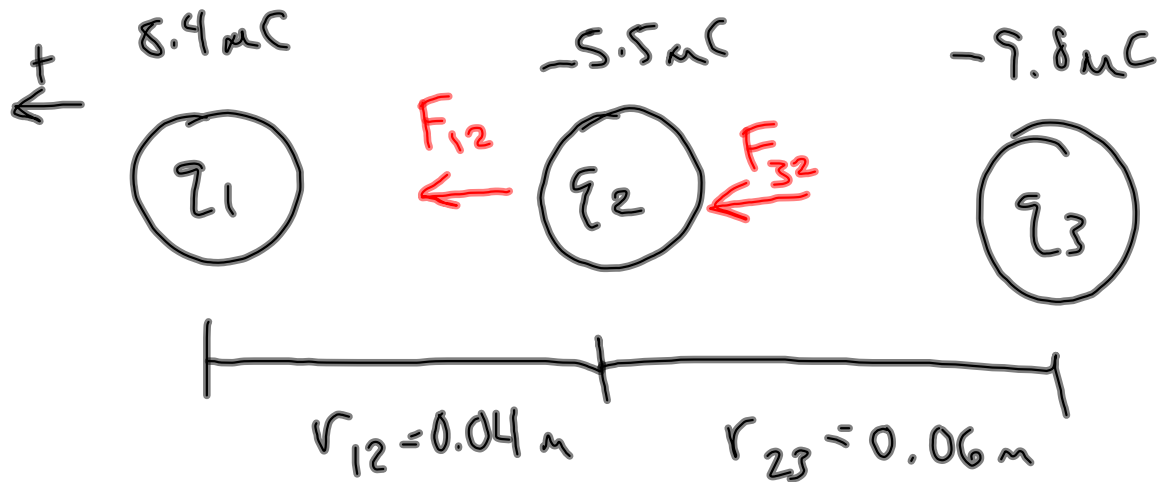
Two charges are stationary in space, and the first has a value of $-70 \mu\text{C}$ and the second has a value of $82 \mu\text{C}$. If the distance separating them is 38 cm , what is the force they exert on each other?



$$\begin{aligned}
 \overline{F}_{21} &= \frac{k |q_1| |q_2|}{r^2} \\
 &= \frac{(8.99 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2) (70 \times 10^{-6} \text{ C}) (82 \times 10^{-6})}{(.38 \text{ m})^2} \\
 &= 357 \text{ N}
 \end{aligned}$$

HW 11 Solutions CP Physics

Three charges are placed on a line. The farthest left charge has a value of $8.4 \mu\text{C}$, the middle charge has a value of $-5.5 \mu\text{C}$, and the farthest right charge has a value of $-9.8 \mu\text{C}$. The farthest left and middle charges are separated by 4 cm , and the farthest right and middle charges are separated by 6 cm . What is the net force acting on the middle charge?



$$\Sigma \vec{F} = \vec{F}_{12} + \vec{F}_{32}$$

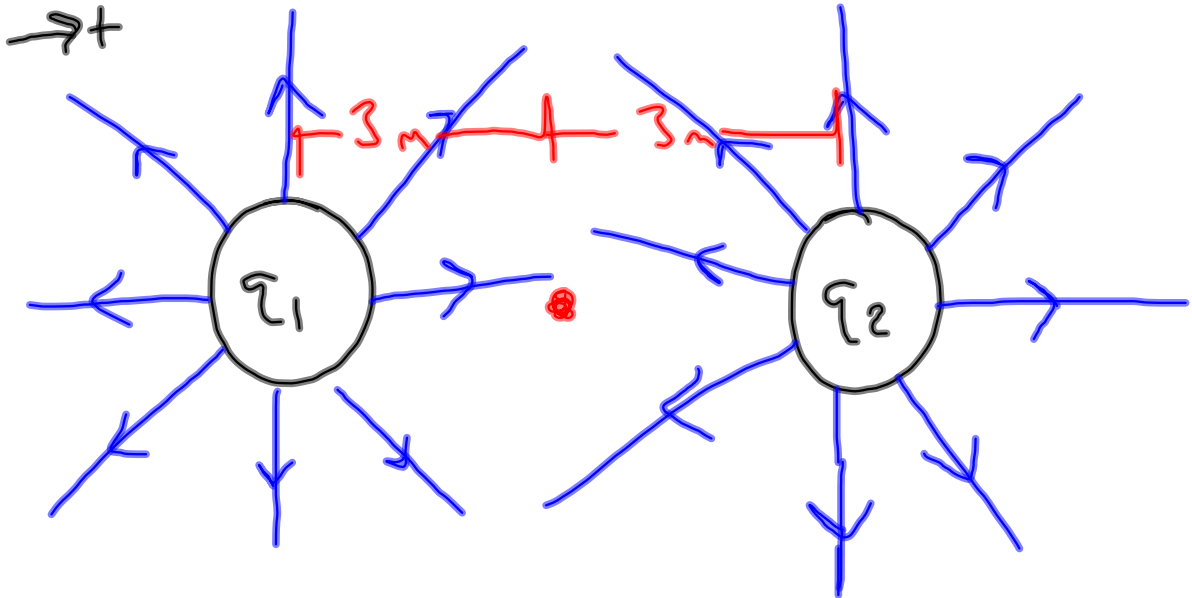
$$= \frac{k|q_1||q_2|}{r_{12}^2} + \frac{k|q_3||q_2|}{r_{23}^2}$$

$$= k|q_2| \left[\frac{|q_1|}{r_{12}^2} + \frac{|q_3|}{r_{23}^2} \right]$$

$$= k(5.5 \times 10^{-6} \text{ C}) \left[\frac{8.4 \times 10^{-6} \text{ C}}{(0.04 \text{ m})^2} + \frac{9.8 \times 10^{-6} \text{ C}}{(0.06 \text{ m})^2} \right]$$

$$= 394 \text{ N}$$

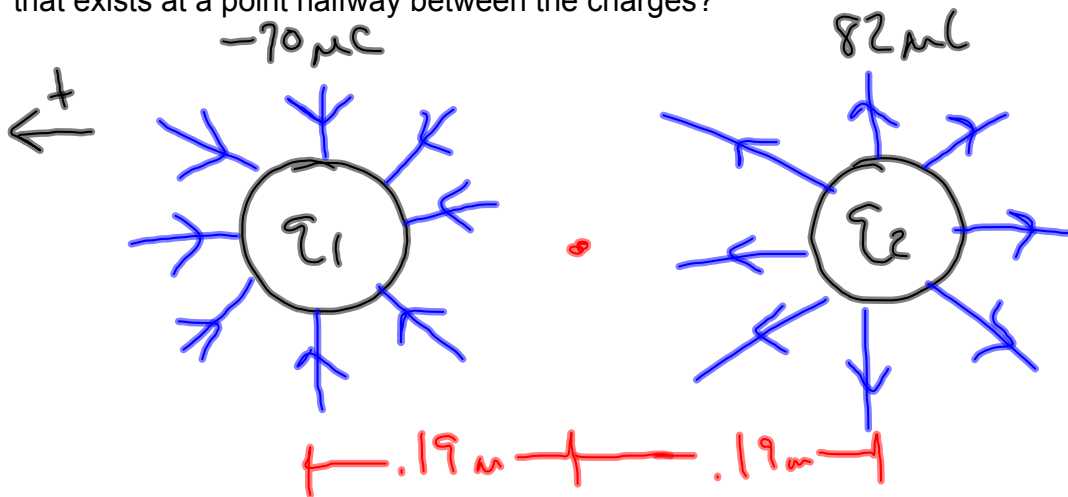
Two charges are stationary in space, and the first has a value of 3.5 C and the second has a value of 5.0 C. If the distance separating them is 6 m, what is the electric field that exists at a point halfway between the charges?



$$\begin{aligned}
 \Sigma \vec{E} &= \vec{E}_1 + \vec{E}_2 \\
 &= \frac{k|q_1|}{r_1^2} - \frac{k|q_2|}{r_2^2} \\
 &= \frac{k(3.5 \text{ C})}{(3 \text{ m})^2} - \frac{k(5.0 \text{ C})}{(3 \text{ m})^2} \\
 &= -1.5 \text{ E } 9 \text{ N/C}
 \end{aligned}$$

HW 11 Solutions CP Physics

Two charges are stationary in space, and the first has a value of $-70 \mu\text{C}$ and the second has a value of $82 \mu\text{C}$. If the distance separating them is 38 cm , what is the electric field that exists at a point halfway between the charges?



$$\Sigma \vec{E} = \vec{E}_1 + \vec{E}_2$$

$$= \frac{k|q_1|}{r_1^2} + \frac{k|q_2|}{r_2^2} \quad r_1 = r_2$$

$$= \frac{k|q_1|}{r_1^2} + \frac{k|q_2|}{r_1^2}$$

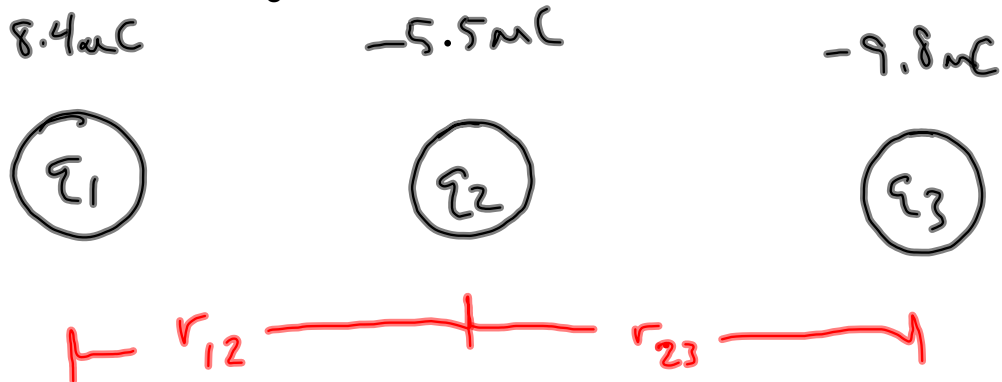
$$= \frac{k}{r_1^2} [|q_1| + |q_2|]$$

$$= \frac{k}{(.19 \text{ m})^2} [(70 \times 10^{-6} \text{ C}) + (82 \times 10^{-6} \text{ C})]$$

$$= 3.79 \times 10^7 \text{ N/C}$$

HW 11 Solutions CP Physics

Three charges are placed on a line. The farthest left charge has a value of $8.4 \mu\text{C}$, the middle charge has a value of $-5.5 \mu\text{C}$, and the farthest right charge has a value of $-9.8 \mu\text{C}$. The farthest left and middle charges are separated by 4 cm , and the farthest right and middle charges are separated by 6 cm . What is the electric field that exists at the point of the middle charge?



$$\Sigma \vec{E} = \frac{\Sigma \vec{F}}{q} \quad \text{from problem \#3}$$

$$= \frac{394 \text{ N}}{(-5.5 \times 10^{-6} \text{ C})}$$

$$= -7.16 \times 10^7 \text{ N/C}$$